Low-kilovoltage single dose intraoperative radiation therapy for breast cancer

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Purpose/Objectivel: Targeted intraoperative radiation therapy (IORT) as an alternative to whole breast irradiation has been described for patients with early-stage breast cancer. The randomized phase III TARGiT trial demonstrated similar recurrence rates to WBI and a lower overall toxicity profile on short-term follow-up. We report on our early Latin American surgical experience using the Intrabeam radiotherapy delivery system.
Materials and Methods: Prospectively gathered estrogen receptor-positive, clinically node-negative patients with invasive breast cancer < 2.5 cm receiving using the Intrabeam system were reviewed. IORT-related effects and early postoperative outcome were assessed.
Results: Seventy eight patients (median age 67 years) underwent lumpectomy, sentinel lymph node biopsy, and concurrent IORT from march 2013 to march 2014. Ninety-five percent of patients had invasive ductal histology with a median tumor size of 1.5 cm.
Conclusions: While a variety of APBI techniques are currently available for clinical use, our early Latin American operative experience with IORT shows it is well tolerated with low morbidity. The addition of WBI may be necessary in situations for positive residual margins or microscopic nodal disease in patients who do not undergo additional surgery. Implementation of IB impacts treatment planning and operating room use in a multidisciplinary breast cancer program. The safety profile, ease of administration, and reduced costs of IB favor its more widespread use in selected patients with early-stage breast cancer.

Early toxicity outcomes: A single 15Gy fraction HDR brachytherapy as pre-treatment EBRT boost in prostate cancer.

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Purpose/Objective: To assess the toxicity of combined therapy between external beam radiation therapy (EBRT) plus high dose rate brachytherapy (HDRB) as a boost in patients with intermediate or high risk prostate cancer.
Materials and Methods: From 2010 to August 2014, a total of 221 patients diagnosed as intermediate or high-risk prostate cancer were treated with EBRT plus HDRB. Median age was 72 years (range 52-85). Most patients (68%) were classified as high-risk (stage T2c-T3b or PSA >20ng/dl or GS>7), and 70 patients (32%) were considered intermediate risk. The stage of tumor was determined in every case by magnetic resonance imaging (MRI). Every patient received first HDRB as boost and 4 gold fiducials were implanted. Finally, all patients received EBRT by intensity modulated radiotherapy technique with imaging guided by CBCT. The patients received HDRB as a single 15 Gy implant, followed by EBRT to 46 Gy in 23 fractions. Thirty seven percent of the high-risk patients presented seminal vesicles invasion receiving a single 9.5 Gy implant, followed by ERBT to 60 Gy in 30 fractions. A total of 117 patients (52%) received a dose of 46 Gy to the true pelvis. In all brachytherapy plans, the constraints indicated in the GEC/ESTRO recommendations have been respected (Rectum D2cc £75Gy EQD2; Urethra D10£ 120Gy EQD2). Most patients (120; 54%) were prescribed complete androgen deprivation therapy (ADT), 66 (29%) received incomplete ADT and 28 (13%) did not receive ADT. GI and GU toxicity was evaluated utilizing the RTOG criteria. Median follow-up was 26 months.
Results: No treatment failure has been observed to the last follow-up. The incidences of any acute ≥ Grade 2 GI or GU toxicities were 0% and 9% respectively. Dysuria and urgency was prevalent symptoms in acute GU toxicity. Late genitourinary toxicity included 2 patients (0.9%) with urine obstruction requiring intermittent/permanent catheter. One case of grade 2 gastrointestinal late toxicity presented actinic rectitis event.
Conclusions: The use of a single 15Gy fraction HDRB as pre-treatment EBRT boost provides early-term and good outcomes in treatment-related toxicity. These data can help physicians to assess this scheme of radiotherapy as an acceptable option in the prostate carcinoma treatment.

APBI single-centre experience over a decade - risk estimates and indication variations within current guidelines

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Purpose/Objective: APBI is currently considered a viable treatment option in early-stage breast cancer patients. Mostly due to the rising need to treat patients outside clinical trials, in 2009 two consensus statements (CS) were created by ASTRO (American Society for Radiation Oncology) and GEC-ESTRO (Groupe Européen de Curiethérapie-European Society for Radiotherapy and Oncology). More recently, guidelines from ABS (American Brachytherapy Society) were also published. This helps the train of thought Radiation Oncologists have to undergo concerning the decision for the most appropriate adjuvant radiation treatment modality in early-stage breast cancer patients. Nevertheless, during that process, doubts may emerge due to the lack of parallelism among the three guidelines that can lead to different risk group stratification/treatment indications for the same patient. Our study aimed at comparing the rate of suitable and unsuitable patients for APBI according to the three guidelines. As a secondary objective survival and relapse rates were also addressed.
Materials and Methods: 81 patients submitted to APBI, in a single-institution, were retrospectively analyzed (treated from 2003 to 2013) and then categorized according to indication for treatment as 'suitable', 'cautionary' and 'unsuitable' (ASTRO), as 'low risk', 'intermediate risk' and 'high risk' (GEC-ESTRO), and as 'acceptable' and 'not acceptable' (ABS). Data regarding tumour, treatment technique and patient-related features was collected, as well as recurrence and survival rates.
Results: Median follow-up time was 35,1 months, 46 patients underwent HDR and 35 a PDR technique either with metal needles or flexible plastic catheters using a template-based system. 75 were suitable for guideline stratification (2 patients lost to follow-up and 6 without complete information about risk factors). According to the ASTRO CS,

47 patients were considered 'suitable', 23 'cautionary' and 5 'unsuitable'. According to GEC-ESTRO, 60 were 'low risk', 7 'intermediate risk' and 8 'high risk'. 69 patients were defined as 'acceptable' and 6 as 'not acceptable' following ABS recommendations. 46 of ABS 'acceptable' patients were also either 'suitable' or 'low risk' according to ASTRO and GEC-ESTRO, meaning an accordance rate between guidelines on who to definitely treat with APBI of 67%. 6% (*n*=4) of patients with clear indication not to treat by ASTRO and/or GEC-ESTRO fitted the 'acceptable' group criteria by ABS. No loco-regional relapses were documented, 1 patient developed distant metastasis.
Conclusions: This study shows a lack of agreement between the current guidelines and supports the existing evidence that APBI with multicatheter brachytherapy is an effective adjuvant treatment modality.

Role of 3T multiparametric MRI in the detection of local recurrent prostate cancer after radical prostatectomy
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Purpose/Objective: To evaluate the role of 3T multiparametric MRI (3TmMRI) without endo-rectal coil (ERC) in the detection of radiographic local recurrences (rLR) in a contemporary cohort of patients with prostate cancer treated at our hospital and who presented a biochemical recurrence after PR with low PSA levels and to identify clinical parameters associated with the findings of the 3TmMRI.
Materials and Methods: Between 2009 and 2013, 57 patients with biochemical recurrence after RP of a PC and considered for salvage radiation therapy (SRT) were included. 3TmMRI with T2-weighted imaging (T2WI), diffusion weighted imaging (DWI) and dynamic contrast-enhanced images (DCE) without ERC was carried out in all the patients prior to treatment. Given that there are no validated criteria, a points system was established to define the findings of the 3TmMRI, 0 being (normal; no abnormality was observed in the MRI sequences: T2WI, DWI or DCE), 1 being (doubtful; an abnormality was detected in one of the MRI sequences, with no correlation in the rest of the sequences) and 2 being (abnormal; abnormality detected in all or in two of the sequences). The local relapse was defined as 2. To analyze the relationship between rLR in 3TmMRI and the clinical variables, a logistic regression analysis was carried out.
Results: In 14/57 patients (24.56%) a rLR through 3TmMRI was detected. Median pre-SRT PSA was 0.40 ng/ml (interquartile range, 0.30-2.05 ng/ml). The location of the recurrence was perianastomotic in 8/14 patients (57.14%) and retrovesical in 6/14 patients (42.86%). The median size of the local recurrence was 15.2 mm (range, 8.0-46.0 mm). The median apparent diffusion coefficient (ADC) value on DWI was 0.90 mm2/s (range, 0.35-1.58 mm2/s) and 6/14 patients (42.85%) presented type 3 pathological captation curves and 3/14 patients (21.42%) presented type 2 enhancement curves in the DCE images. Normal prostate tissue remains were identified in 9/57 patients (15.78%). Pelvic nodal recurrence was evidenced in 4/57 patients (7.01%) and pelvic bone metastasis were found in 4/57 patients (7.01%). 12.90% (4/31) rLR was observed in patients with PSA ≤0.5 ng/ml, vs 38.46% (10/26) for PSA>0.5 ng/ml. The incidence of rLR according to PSA doubling time (PSADT) was 15.% (6/40) for PSADT≤14 months, vs 54.54% (6/11) for PSADT>14 months. The probability of rLR was significantly higher in patients with PSA levels >0.5 ng/ml (adjusted odds ratio (OR): 6.25; 95% confidence interval (CI): 1.27-30.79;p=0.02), or PSA doubling time (PSADT)>14 months (adjusted OR: 7.12; 95% CI:1.40-36.25; p=0.01).
Conclusions: This is the first study to find a significant relationship between the PSADT and the rLR through MRI. Patients that benefit most from conducting a 3TmMRI were those with PSADT>14 months or with pre-SRT PSA >0.5 ng/ml. Its routine use could have significant clinical implications in SRT.

Dosimetric impact to organs at risk when the internal mammary node chain is included in irradiation of left breast
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Purpose/Objective: Recent EORTC studies report an increase in survival in breast cancer patients treated with RT when the internal mammary node (IMN) is included. The aforementioned studies were based on conventional 3D irradiation with photons in breast and supraclavicular and axillary nodes and a direct electron field in the IMN. To our knowledge, the safety of including IMN in IMRT has not been studied to date. The objective of the study was to retrospectively evaluate the dosimetric impact on the usual organs at risk (OAR) in the irradiation of the left breast/chest wall (heart, lungs, and contralateral breast) treated with IMRT.
Materials and Methods: We selected all breast patients (n = 30) treated with IMRT (left breast, left chest wall, with/without nodes and with/without boost) in 2014. CT planning was performed in all patients with a Philips Big Bore CT. We defined the volumes to irradiate and the OAR. We performed a new IMRT planning to compare with the previous technique. We used our standard distribution of fields in each case. Treatment planning and volume definition were defined using the Eclipse V8.9 planning system from Varian. After optimizing dosimetry to obtain the best coverage and homogeneous distribution of PTVs, we compared the dose received in OAR for each of the 2 plans, considering the constraints of our service (mainly based in QUANTEC), which are:
-Heart: V30<30%; V25<15; Dmean<10Gy
-Lung: V5<60%; V20<30%
-Ipsilateral Lung: V20<30%
-Contralateral Lung: V5<40%
-Contralateral Breast: V5<2% (This is an orientation constraint because heart and lung area priority constraint).
We recorded the values of these indexes for IMRT with and without IMN.
Results:
Table 1 shows the mean values recorded for IMRT with and without IMN, and the differences between the two plans. We found a slight increase in dose in OAR when IMN was included, but this increase did not exceed the limits established in our service.

	HEART MEAN ± 1SD			LUNGS MEAN ± 1SD		IPSI LUNG MEAN ± 1SD	CONTRA. LUNG MEAN ± 1SD	CONTRA.BREAST MEAN ± 1SD
	V30<30%	V25<10%	Dmean<10Gy	V5<60%	V20<30%	V20<30%	V5<40%	V5<2%
IMRT-NO IMN	3.7%±3.1%	5.2%±3.7	8.7Gy±1.9Gy	37.6%±12.7%	9.4%±4.3%	19.4%±7.3%	12.2%±12.4%	8.1%±9.7%
IMRT-IMN	5.3%±3.3%	7.3%±3.9%	9.9Gy±2.0Gy	40.6%±12.3%	9.7%±3.5%	21.8%±7.1%	15.0%±13.9%	13.9%±12.7%
DIFF.	1.6%	2.1%	1.1Gy	3.00%	0.4%	2.4%	2.8%	5.8%

TABLE 1

Conclusions: IMN irradiation of the left breast can be safely performed with the new treatment techniques (IMRT) because it does not significantly increase the dose received by the OAR.